FCC SAR TEST REPORT

APPLICANT	:	Verifone, Inc.
Equipment	:	Point of Sale Terminal
Brand Name	:	Verifone
Model Name	:	T650p
FCC ID	:	B32T650P
Standard	:	FCC 47 CFR Part 2 (2.1093)

We, Sporton International Inc. (Shenzhen), would like to declare that the tested sample has been evaluated in accordance with the test procedures given in 47 CFR Part 2.1093 and FCC KDB and has been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.

Si Zhang

Approved by: Si Zhang

ACCREDITED
Cert #5145.01

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History of this test report

Report No.	Version	Description	Issued Date
FA320905	01	Initial issue of report	Apr. 13, 2023

1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for **Verifone, Inc., Point of Sale Terminal, T650p**, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary	
		Limbs (Separation 0mm) 10g SAR (W/kg)	Highest Simultaneous Transmission 10g SAR (W/kg)
Licensed	GSM850	1.26	1.61
	GSM1900	0.71	
	WCDMA II	1.31	
	WCDMA IV	1.27	
	WCDMA V	0.69	
	LTE Band 4	1.03	
	LTE Band 7	**1.56**	
	LTE Band 12	0.26	
	LTE Band 13	0.29	
	LTE Band 2 / 25	1.10	
	LTE Band 5 / 26	0.58	
DTS	2.4GHz WLAN	0.43	
NII	5GHz WLAN	1.43	
DSS	Bluetooth	<0.10	1.61
Date of Testing:		2023/3/1 ~ 2023/4/1	

Remark: This is a variant report for T650p. For model change note, please refer to the T650p_Operational Description of Product Equality Declaration which is exhibited separately. According to the difference, only WCDMA Band II, LTE Band 7 and WLAN 5GHz performed full SAR testing, the worst cases from original test report (Sporton Report Number FA052211-07) for all other Bands were verified for the differences.

Declaration of Conformity:
The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.
Comments and Explanations:
The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (4.0 W/kg for Product Specific 10g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.

2. Administration Data

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR05-SZ	CN1256	421272

Applicant	
Company Name	Verifone, Inc.
Address	1400 W STANFORD RANCH RD SUITE 150 ROCKLIN CA 95765 USA

Manufacturer	
Company Name	Verifone, Inc.
Address	1400 W STANFORD RANCH RD SUITE 150 ROCKLIN CA 95765 USA

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards.

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification	
Equipment Name	Point of Sale Terminal
Brand Name	Verifone
Model Name	T650p
FCC ID	B32T650P
IMEI Code	SIM 1: 015859001925009 SIM 2: 015859001925017
Wireless Technology and Frequency Range	GSM850: 824 MHz ~ 849 MHz GSM1900: 1850 MHz ~ 1910 MHz WCDMA Band II: 1850 MHz ~ 1910 MHz WCDMA Band IV: 1710 MHz ~ 1755 MHz WCDMA Band V: 824 MHz ~ 849 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz WLAN 2.4GHz Band: 2400 MHz ~ 2483.5 MHz WLAN 5.2GHz Band: 5150 MHz ~ 5250 MHz WLAN 5.3GHz Band: 5250 MHz ~ 5350 MHz WLAN 5.6GHz Band: 5470 MHz ~ 5725 MHz WLAN 5.8GHz Band: 5725 MHz ~ 5825 MHz Bluetooth: 2400 MHz ~ 2483.5 MHz CTLS : 13.56 MHz
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM WLAN: 802.11a/b/g/n HT20/HT40 Bluetooth BR/EDR/LE CTLS:ASK
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
EUT Stage	Identical Prototype

Remark:

1. The device is designed for ordering and electronic payment, intended for use in hand; therefore, extremity SAR is necessary to show compliance.
2. The WWAN / WLAN and Bluetooth will not transmit simultaneous at the same time for this device.

4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05	
FCC ID	B32T650P
Equipment Name	Point of Sale Terminal
Operating Frequency Range of each LTE transmission band	LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 7: 2500 MHz ~ 2570 MHz LTE Band 12: 699 MHz ~ 716 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 25: 1850 MHz ~ 1915 MHz LTE Band 26: 814 MHz ~ 849 MHz
Channel Bandwidth	LTE Band 2:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 4:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 5:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 12:1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 13: 5MHz, 10MHz LTE Band 25:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz, 20MHz LTE Band 26:1.4MHz, 3MHz, 5MHz, 10MHz, 15MHz
uplink modulations used	QPSK / 16QAM
LTE Voice / Data requirements	Data only
LTE MPR permanently built-in by design	**Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3**

Modulation	Channel bandwidth / Transmission bandwidth (N_{RB})						MPR (dB)
	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2
64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2
64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3
256 QAM	≥ 1						≤ 5

LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.

Transmission (H, M, L) channel numbers and frequencies in each LTE band

LTE Band 2

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	18607	1850.7	18615	1851.5	18625	1852.5	18650	1855	18675	1857.5	18700	1860
M	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880	18900	1880
H	19193	1909.3	19185	1908.5	19175	1907.5	19150	1905	19125	1902.5	19100	1900

LTE Band 4

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	19957	1710.7	19965	1711.5	19975	1712.5	20000	1715	20025	1717.5	20050	1720
M	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5	20175	1732.5
H	20393	1754.3	20385	1753.5	20375	1752.5	20350	1750	20325	1747.5	20300	1745

LTE Band 5

	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844

LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560

LTE Band 12								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	23017	699.7	23025	700.5	23035	701.5	23060	704
M	23095	707.5	23095	707.5	23095	707.5	23095	707.5
H	23173	715.3	23165	714.5	23155	713.5	23130	711

LTE Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Freq.(MHz)	Channel #	Freq.(MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

LTE Band 25												
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26047	1850.7	26055	1851.5	26065	1852.5	26090	1855	26115	1857.5	26140	1860
M	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880	26340	1880
H	26683	1914.3	26675	1913.5	26665	1912.5	26640	1910	26615	1907.5	26590	1905

LTE Band 26										
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	26697	814.7	26705	815.5	26715	816.5	26740	819	26765	821.5
M	26865	831.5	26865	831.5	26865	831.5	26865	831.5	26865	831.5
H	27033	848.3	27025	847.5	27015	846.5	26990	844	26965	841.5

5. RF Exposure Limits

5.1 Uncontrolled Environment

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

1. Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

$$\mathbf{SAR} = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\mathbf{dm}}\right) = \frac{\mathbf{d}}{\mathbf{dt}}\left(\frac{\mathbf{dW}}{\boldsymbol{\rho}\mathbf{dv}}\right)$$

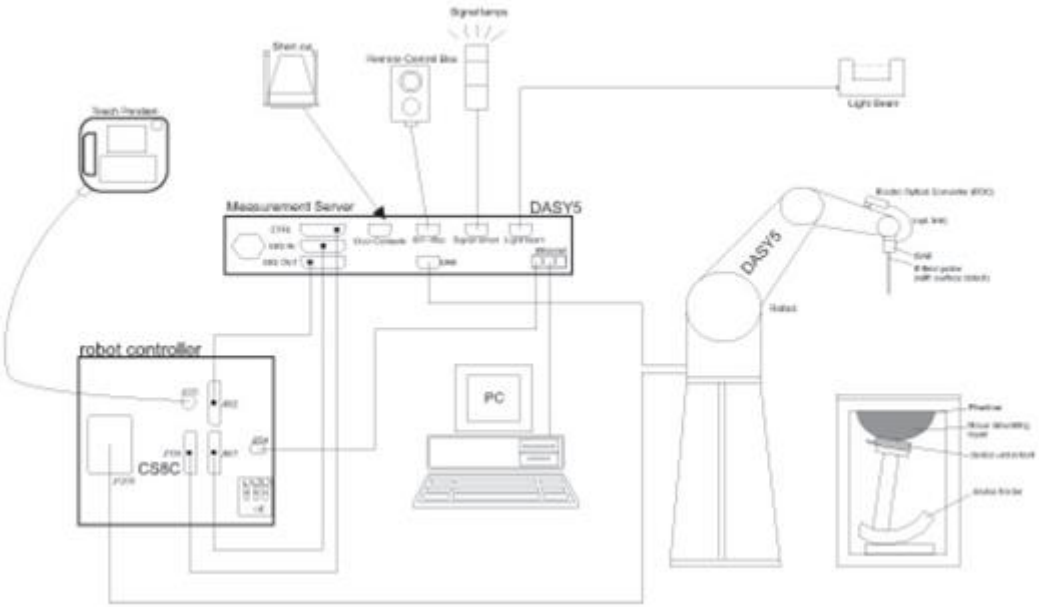
SAR is expressed in units of Watts per kilogram (W/kg)

$$\mathbf{SAR} = \frac{\boldsymbol{\sigma}|\mathbf{E}|^2}{\boldsymbol{\rho}}$$

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:



- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.

7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG).The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ±0.2 dB (30 MHz – 6 GHz)	
Directivity	±0.3 dB in TSL (rotation around probe axis) ±0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 µW/g – >100 mW/g Linearity: ±0.2 dB (noise: typically <1 µW/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 Data Acquisition Electronics (DAE)

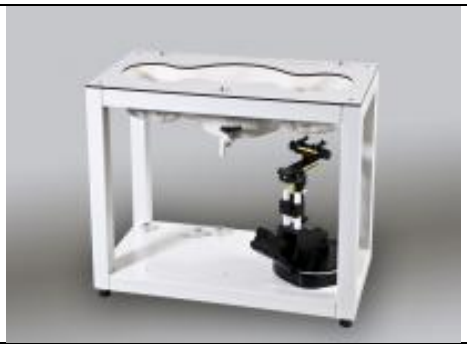
The data acquisition electronics (DAE) consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

Photo of DAE

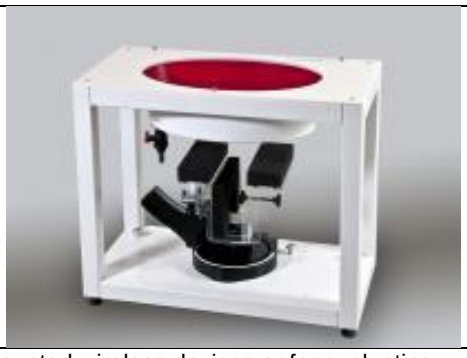
7.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices or for evaluating transmitters operating at low frequencies. ELI is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.

Mounting Device for Hand-Held Transmitters

Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.

Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

(a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
(b) Read the WWAN RF power level from the base station simulator.
(c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
(d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

(a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
(b) Place the EUT in the positions as Appendix D demonstrates.
(c) Set scan area, grid size and other setting on the DASY software.
(d) Measure SAR results for the highest power channel on each testing position.
(e) Find out the largest SAR result on these testing positions of each band
(f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

(a) Power reference measurement
(b) Area scan
(c) Zoom scan
(d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

(a) Extraction of the measured data (grid and values) from the Zoom Scan
(b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
(c) Generation of a high-resolution mesh within the measured volume
(d) Interpolation of all measured values form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	½·δ·ln(2) ± 0.5 mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area}, Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

			≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: Δx_{Zoom}, Δy_{Zoom}			≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$		≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1st two points closest to phantom surface	≤ 4 mm	3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$	
Minimum zoom scan volume	x, y, z		≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm

Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.

* When zoom scan is required and the *reported* SAR from the *area scan based 1-g SAR estimation* procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.

9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	750MHz System Validation Kit	D750V3	1099	Dec. 15, 2021	Dec. 14, 2024
SPEAG	835MHz System Validation Kit	D835V2	4d162	Dec. 17, 2021	Dec. 16, 2024
SPEAG	1750MHz System Validation Kit	D1750V2	1137	Oct. 19, 2021	Oct. 18, 2024
SPEAG	1900MHz System Validation Kit	D1900V2	5d182	Dec. 20, 2021	Dec. 19, 2024
SPEAG	2450MHz System Validation Kit	D2450V2	924	Sep. 02, 2020	Aug. 31, 2023
SPEAG	2600MHz System Validation Kit	D2600V2	1070	Dec. 20, 2021	Dec. 19, 2024
SPEAG	5000MHz System Validation Kit	D5GHzV2	1341	Dec. 13, 2021	Dec. 12, 2024
SPEAG	Data Acquisition Electronics	DAE4	1386	Jun. 30, 2022	Jun. 29, 2023
SPEAG	Dosimetric E-Field Probe	EX3DV4	7641	Apr. 11, 2022	Apr. 10, 2023
SPEAG	ELI Phantom	QD OVA 002 AA	1149	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201300653	Jul. 07, 2022	Jul. 06, 2023
Anritsu	Radio communication analyzer	MT8821C	6262314715	Jun. 27, 2022	Jun. 26, 2023
Keysight	Network Analyzer	E5071C	MY46523671	Oct. 17, 2022	Oct. 16, 2023
Speag	Dielectric Assessment KIT	DAK-3.5	1144	Aug. 15, 2022	Aug. 14, 2023
Agilent	Signal Generator	N5181A	MY50145381	Dec. 27, 2022	Dec. 26, 2023
Anritsu	Power Senor	MA2411B	1306099	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Meter	ML2495A	1349001	Oct. 17, 2022	Oct. 16, 2023
Anritsu	Power Sensor	MA2411B	1542004	Dec. 27, 2022	Dec. 26, 2023
Anritsu	Power Meter	ML2495A	1339473	Dec. 27, 2022	Dec. 26, 2023
R&S	CBT BLUETOOTH TESTER	CBT	100963	Dec. 27, 2022	Dec. 26, 2023
R&S	Spectrum Analyzer	FSP7	100818	Jul. 07, 2022	Jul. 06, 2023
TES	Hygrometer	1310	200505600	Jul. 12, 2022	Jul. 11, 2023
Anymetre	Thermo-Hygrometer	JR593	2020062101	Jul. 12, 2022	Jul. 11, 2023
SPEAG	Device Holder	N/A	N/A	N/A	N/A
AR	Amplifier	5S1G4	0333096	Note 1	
Mini-Circuits	Amplifier	ZVE-3W-83+	599201528	Note 1	
ARRA	Power Divider	A3200-2	N/A	Note 1	
ET Industries	Dual Directional Coupler	C-058-10	N/A	Note 1	
Weinschel	Attenuator 1	3M-10	N/A	Note 1	

General Note:

1. Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check
2. Referring to KDB 865664 D01v01r04, the dipole calibration interval can be extended to 3 years with justification. The dipoles are also not physically damaged, or repaired during the interval.
3. The justification data of dipole can be found in appendix C. The return loss is < -20dB, within 20% of prior calibration, the impedance is within 5 ohm of prior calibration.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

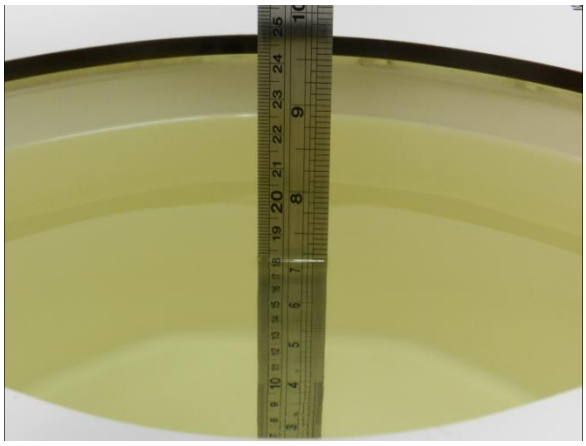


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (εr)
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0

Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (ε_r)	Conductivity Target (σ)	Permittivity Target (ε_r)	Delta (σ) (%)	Delta (ε_r) (%)	Limit (%)	Date
750	Head	22.3	0.880	40.752	0.89	41.90	-1.12	-2.74	±5	2023/3/1
835	Head	22.2	0.904	41.804	0.90	41.50	0.44	0.73	±5	2023/3/2
1750	Head	22.4	1.392	40.573	1.37	40.10	1.61	1.18	±5	2023/3/3
1900	Head	22.1	1.453	39.136	1.40	40.00	3.79	-2.16	±5	2023/3/31
2450	Head	22.4	1.848	40.071	1.80	39.20	2.67	2.22	±5	2023/3/5
2600	Head	22.5	1.971	38.223	1.96	39.00	0.56	-1.99	±5	2023/3/31
5250	Head	22.3	4.525	36.329	4.71	35.95	-3.93	1.05	±5	2023/4/1
5600	Head	22.4	4.871	35.856	5.07	35.50	-3.93	1.00	±5	2023/4/1
5750	Head	22.3	5.029	35.671	5.22	35.35	-3.66	0.91	±5	2023/4/1

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg)	Targeted 10g SAR (W/kg)	Normalized 10g SAR (W/kg)	Deviation (%)
2023/3/1	750	Head	250	1099	7641	1386	1.420	5.650	5.68	0.53
2023/3/2	835	Head	250	4d162	7641	1386	1.580	6.260	6.32	0.96
2023/3/3	1750	Head	250	1137	7641	1386	4.960	19.200	19.84	3.33
2023/3/31	1900	Head	250	5d182	7641	1386	5.020	20.200	20.08	-0.59
2023/3/5	2450	Head	250	924	7641	1386	6.330	24.000	25.32	5.50
2023/3/31	2600	Head	250	1070	7641	1386	6.340	24.600	25.36	3.09
2023/4/1	5250	Head	100	1341	7641	1386	2.300	23.100	23	-0.43
2023/4/1	5600	Head	100	1341	7641	1386	2.460	24.000	24.6	2.50
2023/4/1	5750	Head	100	1341	7641	1386	2.380	22.700	23.8	4.85

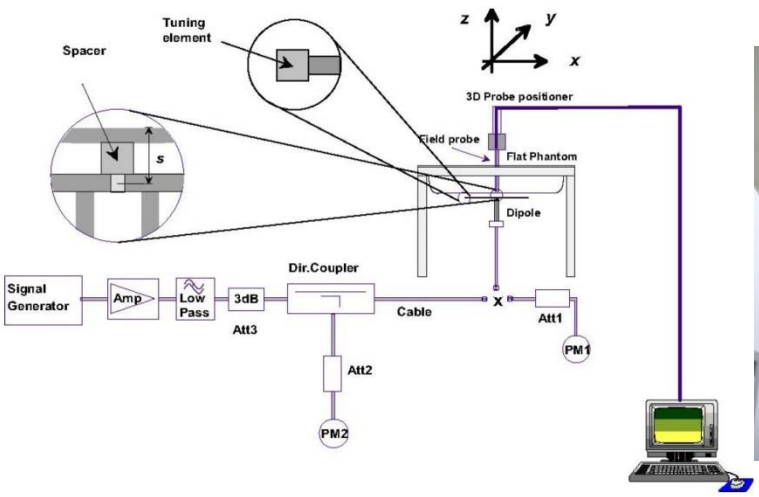


Fig 8.3.1 System Performance Check Setup

Fig 8.3.2 Setup Photo

11. RF Exposure Positions

11.1 Body Device

(a) To position the device parallel to the phantom surface with either keypad down.

(b) To adjust the device parallel to the flat phantom.

(c) To adjust the distance between the device surface and the flat phantom to 0 mm

<EUT Setup Photos>

Please refer to Appendix D for the test setup photos.

12. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
   a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
   b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
   c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
   d. For WLAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
   · ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
   · ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
   · ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is ≥0.8W/kg.
4. The following table “n/a” in the result means the SAR cube is too small to be found.

UMTS Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all “1’s”.
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA is ≤ ¼ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than ¼ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is > not ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, Smaller bandwidth output power for each RB allocation configuration is > not ½ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B4/B5/B12/B26 the maximum bandwidth does not support three non-overlapping channels, per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.
7. LTE band 2/5 SAR test was covered by Band 25/26; according to TCB workshop, SAR test for overlapping LTE bands can be reduced if
   a. The maximum output power, including tolerance, for the smaller band is ≤ the larger band to qualify for the SAR test exclusion.
   b. The channel bandwidth and other operating parameters for the smaller band are fully supported by the larger band.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is ≤ 1.2 W/kg, SAR is not required for U-NII-1 band.
3. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
4. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

12.1 Limbs SAR

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
01	GSM850	-	-	-	-	GPRS(2 TX slot)	Right Side	0mm	251	848.8	31.90	32.00	1.023	-	-	0.03	1.230	**1.259**
02	GSM1900	-	-	-	-	GPRS(4 TX slot)	Right Side	0mm	512	1850.2	25.30	26.00	1.175	-	-	-0.12	0.603	**0.708**
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Front	0mm	9538	1907.6	23.37	24.00	1.156	-	-	0.19	0.156	0.180
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Back	0mm	9538	1907.6	23.37	24.00	1.156	-	-	0.04	0.425	0.491
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Left Side	0mm	9538	1907.6	23.37	24.00	1.156	-	-	0.04	0.697	0.806
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	9538	1907.6	23.37	24.00	1.156	-	-	-0.08	1.080	1.249
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Top Side	0mm	9538	1907.6	23.37	24.00	1.156	-	-	-0.02	0.482	0.557
	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	9400	1880	23.36	24.00	1.159	-	-	-0.14	1.040	1.205
03	WCDMA II	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	9262	1852.4	23.31	24.00	1.172	-	-	-0.12	1.120	**1.313**
04	WCDMA IV	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	1413	1732.6	23.43	24.00	1.140	-	-	-0.06	1.110	**1.266**
05	WCDMA V	-	-	-	-	RMC 12.2Kbps	Right Side	0mm	4233	846.6	23.69	24.00	1.074	-	-	0.02	0.639	**0.686**
06	LTE Band 4	20M	QPSK	1	0	-	Right Side	0mm	20175	1732.5	23.56	24.00	1.107	-	-	0.06	0.927	**1.026**
	LTE Band 7	20M	QPSK	1	0	-	Front	0mm	21100	2535	23.50	24.50	1.259	-	-	0.16	0.384	0.483
	LTE Band 7	20M	QPSK	1	0	-	Back	0mm	21100	2535	23.50	24.50	1.259	-	-	0.03	0.196	0.247
	LTE Band 7	20M	QPSK	1	0	-	Left Side	0mm	21100	2535	23.50	24.50	1.259	-	-	0.18	0.312	0.393
07	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	21100	2535	23.50	24.50	1.259	-	-	-0.08	1.240	**1.561**
	LTE Band 7	20M	QPSK	1	0	-	Top Side	0mm	21100	2535	23.50	24.50	1.259	-	-	-0.04	0.235	0.296
	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	20850	2510	23.39	24.50	1.291	-	-	0.01	1.100	1.420
	LTE Band 7	20M	QPSK	1	0	-	Right Side	0mm	21350	2560	23.39	24.50	1.291	-	-	0.08	1.050	1.356
	LTE Band 7	20M	QPSK	50	0	-	Front	0mm	21100	2535	22.45	23.50	1.274	-	-	0.01	0.274	0.349
	LTE Band 7	20M	QPSK	50	0	-	Back	0mm	21100	2535	22.45	23.50	1.274	-	-	-0.1	0.147	0.187
	LTE Band 7	20M	QPSK	50	0	-	Left Side	0mm	21100	2535	22.45	23.50	1.274	-	-	0.03	0.237	0.302
	LTE Band 7	20M	QPSK	50	0	-	Right Side	0mm	21100	2535	22.45	23.50	1.274	-	-	0.09	0.787	1.002
	LTE Band 7	20M	QPSK	50	0	-	Top Side	0mm	21100	2535	22.45	23.50	1.274	-	-	-0.04	0.150	0.191
08	LTE Band 12	10M	QPSK	1	0	-	Top Side	0mm	23095	707.5	23.98	24.00	1.005	-	-	0.02	0.261	**0.262**
09	LTE Band 13	10M	QPSK	1	0	-	Top Side	0mm	23230	782	23.76	24.00	1.057	-	-	-0.11	0.278	**0.294**
10	LTE Band 25	20M	QPSK	1	0	-	Right Side	0mm	26140	1860	23.34	24.00	1.164	-	-	-0.12	0.941	**1.095**
11	LTE Band 26	15M	QPSK	1	0	-	Right Side	0mm	26865	831.5	23.75	24.00	1.059	-	-	0.18	0.549	**0.582**
12	WLAN2.4GHz	-	-	-	-	802.11b 1Mbps	Right Side	0mm	6	2437	17.40	18.00	1.148	97.05	1.030	0.06	0.365	**0.432**
	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Front	0mm	60	5300	14.30	15.00	1.175	86.67	1.154	-	n/a	n/a
13	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	60	5300	14.30	15.00	1.175	86.67	1.154	-0.16	0.112	**0.152**
	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	60	5300	14.30	15.00	1.175	86.67	1.154	-0.12	0.058	0.079
	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Bottom Side	0mm	60	5300	14.30	15.00	1.175	86.67	1.154	-	n/a	n/a
	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	52	5260	14.30	15.00	1.175	86.67	1.154	-0.14	0.084	0.114

	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	56	5280	14.30	15.00	1.175	86.67	1.154	0.03	0.088	0.119
	WLAN5.3GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	64	5320	13.00	15.00	1.585	86.67	1.154	-0.02	0.069	0.126
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Front	0mm	116	5580	14.40	15.00	1.148	86.67	1.154	-	n/a	n/a
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	116	5580	14.40	15.00	1.148	86.67	1.154	-0.03	0.725	0.961
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	116	5580	14.40	15.00	1.148	86.67	1.154	-0.12	0.268	0.355
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Bottom Side	0mm	116	5580	14.40	15.00	1.148	86.67	1.154	0.16	0.162	0.215
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	100	5500	13.10	15.00	1.549	86.67	1.154	-0.05	0.313	0.559
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	124	5620	14.40	15.00	1.148	86.67	1.154	0.09	0.824	1.092
	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	132	5660	14.40	15.00	1.148	86.67	1.154	0.19	0.878	1.163
14	WLAN5.5GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	144	5720	14.40	15.00	1.148	86.67	1.154	0.01	0.990	**1.312**
	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Front	0mm	149	5745	14.40	15.00	1.148	86.67	1.154	-	n/a	n/a
15	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	149	5745	14.40	15.00	1.148	86.67	1.154	0.06	1.080	**1.431**
	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Right Side	0mm	149	5745	14.40	15.00	1.148	86.67	1.154	0.04	0.324	0.429
	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Bottom Side	0mm	149	5745	14.40	15.00	1.148	86.67	1.154	-0.18	0.221	0.293
	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	157	5785	14.30	15.00	1.175	86.67	1.154	0.03	0.887	1.203
	WLAN5.8GHz	-	-	-	-	802.11a 6Mbps	Back	0mm	165	5825	14.40	15.00	1.148	86.67	1.154	-0.1	0.900	1.192
16	Bluetooth	-	-	-	-	DH5 1Mbps	Right Side	0mm	78	2480	5.83	7.00	1.309	77.13	1.297	0.12	0.004	**0.006**

13. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Limbs
1.	WWAN + Bluetooth	Yes

General Note:

1. For simultaneously transmission SAR analysis, WWAN band and BT SAR Chose higher SAR between original project and variant project to perform co-located SAR analysis, others exposure position test results were chosen from the original data which released from original report to do co-located analysis.
2. WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
3. All licensed modes share the same antenna part and cannot transmit simultaneously
4. EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
5. The Scaled SAR summation is calculated based on the same configuration and test position.
6. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
   i) Scalar SAR summation < 1.6W/kg.
   ii) SPLSR = (SAR1 + SAR2)^1.5 / (min. separation distance, mm), and the peak separation distance is determined from the square root of [(x1-x2)2 + (y1-y2)2 + (z1-z2)2], where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
   iii) If SPLSR ≤ 0.04, simultaneously transmission SAR measurement is not necessary.
   iv) Simultaneously transmission SAR measurement, and the reported multi-band SAR < 4W/kg.

13.1 Limbs Exposure Conditions

WWAN Band	Exposure Position	1 WWAN 10g SAR (W/kg)	17 Bluetooth 10g SAR (W/kg)	1+17 Summed 10g SAR (W/kg)
GSM850	Front	0.374	0.001	0.38
	Back	0.343	0.001	0.34
	Left side	0.463		0.46
	Right side	1.259	0.051	1.31
	Top side	0.236		0.24
	Bottom side		0.029	0.03
GSM1900	Front	0.102	0.001	0.10
	Back	0.271	0.001	0.27
	Left side	0.524		0.52
	Right side	0.733	0.051	0.78
	Top side	0.378		0.38
	Bottom side		0.029	0.03
WCDMA II	Front	0.183	0.001	0.18
	Back	0.498	0.001	0.50
	Left side	0.817		0.82
	Right side	1.313	0.051	1.36
	Top side	0.565		0.57
	Bottom side		0.029	0.03
WCDMA IV	Front	0.291	0.001	0.29
	Back	0.356	0.001	0.36
	Left side	0.460		0.46
	Right side	1.266	0.051	1.32
	Top side	0.773		0.77
	Bottom side		0.029	0.03
WCDMA V	Front	0.261	0.001	0.26
	Back	0.216	0.001	0.22
	Left side	0.293		0.29
	Right side	0.686	0.051	0.74
	Top side	0.200		0.20
	Bottom side		0.029	0.03
LTE Band 4	Front	0.287	0.001	0.29
	Back	0.335	0.001	0.34
	Left side	0.423		0.42
	Right side	1.026	0.051	1.08
	Top side	0.759		0.76
	Bottom side		0.029	0.03
LTE Band 7	Front	0.483	0.001	0.48
	Back	0.247	0.001	0.25
	Left side	0.393		0.39
	Right side	1.561	0.051	**1.61**
	Top side	0.296		0.30
	Bottom side		0.029	0.03
LTE Band 12	Front	0.188	0.001	0.19
	Back	0.215	0.001	0.22
	Left side	0.183		0.18
	Right side	0.193	0.051	0.24
	Top side	0.262		0.26
	Bottom side		0.029	0.03
LTE Band 13	Front	0.188	0.001	0.19
	Back	0.343	0.001	0.34
	Left side	0.163		0.16

	Right side	0.272	0.051	0.32
	Top side	0.414		0.41
	Bottom side		0.029	0.03
LTE Band 25	Front	0.164	0.001	0.17
	Back	0.412	0.001	0.41
	Left side	0.650		0.65
	Right side	1.269	0.051	1.32
	Top side	0.673		0.67
	Bottom side		0.029	0.03
LTE Band 26	Front	0.243	0.001	0.24
	Back	0.197	0.001	0.20
	Left side	0.264		0.26
	Right side	0.582	0.051	0.63
	Top side	0.183		0.18
	Bottom side		0.029	0.03

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14. Uncertainty Assessment

Per KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be ≤ 30%, for a confidence interval of k = 2. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

15. References

[1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”

[2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992

[3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013

[4] SPEAG DASY System Handbook

[5] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.

[6] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015

[7] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015

[8] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015

[9] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.

[10] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.